Notebook Series -- Notebooks by Edison
Notebook, N-19-09-09

This notebook is a continuation of N-19-08-26. It was used by Edison in September 1919. Included are descriptions of numbered electrolytic and chemical preparations, some marked "Ford" if they appeared promising for use in starter batteries for Ford automobiles. One entry relates to tests with parchment for the starter battery. Another group of entries, entitled "L Ott Experiments," focuses on plating experiments for starter batteries and possibly for disc record molds. Also included is an entry generalizing about the "flake plating Auto scheme." In addition, there are notes on a series of experiments on separating nickel flake, along with experiments on copper and nickel plating for battery cells. There are also occasional entries referring to work on perfecting disc record molds and blanks, as well as to improvements on electrolytic cleaning of record masters. At the end of the book is a list, transcribed and amended from N-19-08-26, of experiments in progress or finished as of August 27, 1919. The entries in this book again reveal the convergence of Edison's work on battery and disc record manufacture in terms of electroplating. The notes indicate that Adolph F. Gall, Frederick P. Ott, and Ludwig F. (Louis) Ott assisted Edison. Inserted into the book is a communication from E. E. Dougherty about work in progress. The front cover is labeled "Very Important" and "No 4 General Book Sept 9 1919." The pages are unnumbered. Approximately 100 pages have been used.

Sept 9 1919 — Plating MnO_2 & Ink

359 - 1 Hour 6 grm Phenol tribromide — Anode & Sol OK bottom stripped
NG

379 - 1 Hour Metaphenylenediamin Basic froth. Muddy black deposit on Cathode NG

365 1 hour 6 gr Perchloro benzol Anode & Sol clear Cracked & peeled —
NG

360 - 1 hour 6 grms Retene — Sol & Anode OK peeled & cracked
NG

362 1 hour 6 grm Alpha Naphtol Sol cloudy Anode clear all cracked & dark at Edges
NG

364 - 1 hour 6 grms Paranitrochloro benzol Clear Sol Anode OK all Cracked
NG

Sept 10 1919

334 - 1 Hour 6 gm Nitroanilin Ortho
Anode ok - Sol dark yellow
thin deposit center metal
outside black NG

393 - 1 Hour - 6 gr Paraphenylendiamin
Acetate, froth, Anode black
black thin deposit NG

378 - 1 hour 6 gm Amidoazobenzol
Anode & Sol Clean
All peeled & Cracked NG

381 - 1 hour Trichlorophenol
Anode & Sol Clear peeled NG

380 - 1 hour 6 gms Benzidin base
froth, Anode Clean
Cracked & peeled NG

371 - 1 hour 6 gr Azobenzol.
Sol Clear Anode Clean
Cracked & peeled off - NG

363 — 1 Hour Sol Clear Anode OK
6 gr Anthracinon — Peeled —

392 — 1 Hour 6 gr Diphenylamine Acetate
Anode & Sol Clear Plated OK
1 corner slightly raised, broke
1st bend —

277 — 1 Hour Anode clear
Precip in Liquid of $Ni(OH)_2$
Solution is Nickel Polarized
Nitrite alone, good for making
$Ni(OH)_2$

388 — 6 grm Cresotinic Soda 1 Hour
frothed — Anode clear sol dark red
Cracked & peeled NG

391 = 1 Hour Alanin - Soda
Sol slightly Cloudy Anode
OK Cracked & peeled NG

203 — 1 hour 6 gr Amidopropionate
of Sodium — froth sol cloudy
Anode reddish —
All cracked & peeled NG

Lithia Benzoate

NG

Duplicates Sat Sol N.504
No 134 —
of Lithium Benzoate,
3 Hours 100 ma per inch
All badly frothed seems to a new
chlorocellulose Solutions were
Clear when put in —

2 grms of Li Benzoate broke 4th
flat full little spots sunken
bubbles I guess — turned up along Edges

4 grms flat, 5 bends, turned up
along Edges Considerable depressed
spots

8 grms — slightly turned at Edges
full spots. broke 5

12 grms — Spots less turned
up considerable all
along Edges + top + bottom
Ends broke 3rd

16 grms no improvement

Lithia Benzoate NG

281 – 1 Hour 6 grm Magnesium Nitrite – Sol & anode OK Black paste, good adherance

395 – 1 Hour – 6 grm Chrysophanate Sodium Anode OK Sol black peeled & cracked NG

40 – 1 hour Saturated Sol of Nickel Chlorate froths Anode OK Sol Cloudy NG – black powder probably Ni + some Chlorate NG

390 – 1 hour 6 gr Oxy Naphthalate Soda froths. good adherent Nickel hydroxide Coat most has already come off – wants paper argument

50 – ½ Hour 6 gr Paramidophenol Sulphate. Anode brown has a deposit Cathode all cracked not peeled NG

This might be useful

Ford — S

149 — 1 hour 6 gr Cadmium Bromate Anode sol clear only little Ni at top — all the rest of surface free of nickel —

387 — 1 hour 6 gr Camphorate Sodium froths anode turned brown Sol clear One corner turned up — broke 3rd — Matte Lead Color

361 — 1 hour 6 gr Monochlorophenol peculiar smell Sol cloudy Anode clear All curled + Cracked NG

359 = 1 hour 6 gr Ulmic Soda Sol dark Anode OK Whole bottom turned up NG

36 — 1 hour 200 cc H_2O saturated with 30 grms Ni K Sulfate Sol + Anode clear Then made up to 250 cc with Strongly adherent thick Nickel Hydroxide —

Good

383-1 hour 6 gr Urate Soda
Sol + anode OK all
Cracked + peeled NG

286-1 hour 6 grms ? ? is there
any $NiSO_4$ in this ? -
precip — anode clear —
peeled + Ckd NG

370-1 hour 6 gr Para Anisidin
froths Sol black anode OK
Ni in Center Borders black NG

368-1 hour Aceto Toluidin
Sol + anode OK make flake
1 NG —

86- Nickel Formate
Cloudy - froth Sol has
precip + No $NiSO_4$? queer in
this anode OK black Center
Green Ni Hydrox around
Edges -

Try all the Chlorates with Ni Cathode - for Form

Form →

Form →

Form →

394 — 1 hour 6 gr Valerianate Soda froths much - Ni all ckd + peeled NG.

355 — 1 hour 6 gr Capraivic Soda froth - Sol + anode ok peeled off in liquid NG

331 — 1 hour 6 grms Paranitroacetanilid Sol + anode ok fine Cracked NG

150 1 hour Cadmium Chlorate 6 grms Anode + Sol ok Makes a Nickel Mud - adherent May be of use,

254 — 1 hour 6 grms Zinc Chlorate Sol + Anode ok Very tenacious black substance May be useful, quite thick

120 - 1 hour 6 grms Magnesia Chlorate Sol clear Anode ok Black smooth deposit - thin —

Good—

Note Chlorates give black deposits on Cathode, probably black Mn hydroxide

333 – 1 hour Ortho nitro Benzaldehyde Sol + anode OK peeled + Cracked — NG

164 – One hour 6 gr Cobalt Chlorate Sodium – Anode clean Very adherent black deposit Cant rub off May be useful — It comes off as a sheet on making it anode in NaOH 140 ma for 2" its quite tough like thin hard rubber, S S + is not metal –

384 – 1 hour Para Quinolin Sulphuric Soda Sol + anode Clear. Cracked + peeled NG

209 – 1 hour 6 gr Resorcin Sol + anode Clear Cracked along Edges NG

385—1 Hour 6gr. Para Mono
Chromo Benzoate Soda
Sol clear + frothy
Anode brownish brake 3"
one Edge turned up slightly at
top —

386—1 hour 6gr Aloetinic Acid
Soda, Very large froth
Anode clear Sol very cloudy
No deposit NG

35—1 hour Saturated
Sol of Succenate of
Nickel — Some white
flakes in Sol otherwise
Clear Anode Clean
peeled, brittle, few cracks

28—1 hour Saturated Sol
of Ammonium Oxalate of
Nickel Sol + anode
Clear think dark
deposit, brittle + NG

268 – 1 hour 6 gms Antimony Citrate
Sol clear Anode OK
Top peeled, brake 1st band

154 1 hour 6 gms Cadmium
Selenate, Cloudy Sol –
Anode black thin –
All cracked up NG

396 1 hour 6 gr Phenatol
(Ethyl phenate) Sol clear
Anode OK one Corner turned
up-peeled, Very brittle film

74 – 1 Hour 75 cc Saturated
Nickel monochloroacetate
diluted to 250 cc
Sol clear Anode OK
Part $Ni(OH)_2$ + part Ni NG.

289 – 1 hour 6 gms Ferric Potassium
Oxalate. Clear sol Anode
brownish tint Edges
Cracked –

Forward

67 – 1 hour 3 grms Xylidin Sulfate, dark sol Anode black tint, M all mud flocks & all cracks Varnish NG

283 – 1 hour 6 gr Mg Nitly Oxalate. Sol cloudy Anode OK Nearly peeled off – OK but Grille

284 – 1 hour 6 gr Palladium Nitly Oxalate Cloudy Anode OK Perfect but self dropped in Sol Very bright metallic –

139 – 1 hour 6 gr Lithium Chlorate Sol Clear Anode OK Black very adherent deposit

287 – 1 hour – Antimony Soda Oxalate Cloudy Anode OK all peeled + CK at Edges

44 = 1 hour Saturated sol Nickel Potassium tartrate, 6 grs precip – Anode OK Very thin dark deposit NG

Found

29A — Phenomenon
Anode bright but
covered all over by
a transparent glass
like substance brittle
its like mica
Investigate it

397 — 1 hour — Picrate Soda —
Clear sol Anode tint red il
part Ni + part black film over
Ni —

29-B — Saturated Sol Oxalate
Soda + Nickel — 1 Hour
Light Colored sol cloudy
Anode bright, some green
NiOH, + black NG

29 A. Saturated sol of 1 Hour
Potassium Nickel Oxalate
deep green sol, clear
Cathode No metal coated
thin yellowish very adherent
deposit, Anode no apparent

105 1 hour 2½ gr Potassic Aluminum
Tartrate Sol Clear Anode
OK Edges cracked
Top peeled —

288 — 1 hour 6 gr Cobalt +
Potassium Oxalate.
Sol cloudy Anode OK
Cracked + Peeled

(35)

Phenomenon →
Note well —

↓

Note

Dup 233 8 grms Sodium Hippurate
Sol - anode OK peeled - almost
Entirely off & 2nd Coat on

Dup 233 - 2 grms Na Hippurate
Sol Cloudy anode brown
~~tent~~ - Plated OK -
broke 2nd Gend

Dup 233 4 grms Na Hippurate
Sol Cloudy, Cant get off - pitting it drop off in back & 2nd coating adhered

Dup 353 - 20 grms Glacial Acetic
acid. Sol & anode OK
Very thin - perfect, broke 1st
Gend, Curls up when
pulled off -

ditto - 12 grms Glacial Acetic
Thicker - broke 1st Gend
Curls up

ditto 40 grms Glacial Acetic
found it OK but ~~left~~
curled away from Cathode
but no ni on Cathode
broke 1st broke 1st Gend -
streaks

What is this
Reaction
Curious —
may be useful

Sat Sol Ferrous Sulfate
6 grms Magnesium Acetate
all mucked up nearly
solid red stuff —
Anode Sol only slightly
Cloudy / Other Clarified
3 40 pm — off 5 pm — only traces iron
deposited that dark —

Dep 339 — 16 12 8 4 + 2
grams Sodium Palmitate
in 2 hours all peeled
Cracked + NG —
Very said Even 2
grams dropped dissolved —
NG

Dep — 297 — 3 hours. 40 grms
Sodium Acetate in 250 cc
N. SO4 — all dissolved —
froths much — Sol clear Anode
little darkish.
Plating thin — spots in Center
none at all Cant strip
only little — Sol must
attack the metal
probably peeled & fell in Jar

Dup 297 – 20 grms Acetate
Sol – only little froth.
Sol fairly Clear Anode
darkish tint at sides –
found strip peeled its thick
& good, pretty peeled
in 2 3/4 hours broke 2nd bend
its springy & some curled
but easily acts.

Dup 350. 2 grms Hexachlorethane
didnt all dissolve
Sol clear Anode ok
Edges turned up. good plating
broke 2nd sets – fair result

~~Dup~~ 400. Mg Palmitate,
2 gr not all dissolved
Sol clear Anode OK
turned up at top – full
~~depressed bubbles~~ . 5
bends. Has no spring
to it – dead soft –
as it was full of bubbles
rotation might work

Ford-Starler Cranes artificial parchment #56. after soaking for 48 hours in 20% NaOH, then washing out the NaOH I find it very tough. While in NaOH, if you ~~bend it~~ can bend it & it will smooth back but if you leave it bent & wash out NaOH the bend is permanent. This parchment is a red color apparently. I don't know the original thickness but water wet it appears to be swelled to at least .040 to .050-

Mill 50 Woven Antique has swelled to .20/1000 & I think is thick enough for separators.

Mill 20 Antique is thicker,

Crane Parchment #44
has swelled to 1/32 about its
tough,

another parchment is
about 20/100

No 6 swelled to 1/32
tough - its like parchment

Ditto #5 ok 1/32 tough

#4 same smoother

#3 has swelled to over
1/16 ?

The thickest swelled
to 1/8 scant
think this is blotting
paper, No 4 seems OK
but could be thinner

I think the Nu Off
parchmentizer all the
above papers —
How about Resistance

perhaps we may have to use 3 or 4 very open papers so parchmentizing action of NaOH will not close the holes + then put them together.

We should get dog smooth plates lay paper between each plate both side holes we prepared in battery soak in NaOH 20% for tighten the bolts with springs + set aside in NaOH 20% for time tests after measuring everything — dittos with carbolos

dittos papers at 120° Fahr

fond

→ NOTE

48 – 1 hour 6 grms Pyridin
slightly acid – Sol + anode OK
Scarcely a trace of deposit

231 – 1 hour 3 grms Salicin
Clear Sol + anode
Cant strip

98 – 1 hour 3 grms Caffeine Sulphate
Sol + anode OK black deposit
come in under + NG

37 1 hour Saturated Sol of
Nickel Bromate.
Sol dark anode OK only
few dabs of black stuff

68 – 1 hour 6 grms Picolin –
Sol + anode OK dark very
little metal

401 – 1 hour 6 grms Benzidin Acetate
froth – Sol dark Anode OK
Scrapes off to a flake
fairly thin

Note

Note

398 - 1 hour Paraamidophenol Acetate, froths, Very Blue Sol - Anode at Very thin black deposit -

Dyr.

Note. I took a piece of of CuO plate cut from Reg S Lake plate 5/8 ogl & the small Zinc Cast 1/4 x 3/4 - 4" long put it in Conc Acetate soda to which I added only a little 20% NaOH, probably 50 cc or less Total Electrolyte 250 cc, its been on 74 hours at noon Sept 15 Sol Clear been at 50 ma - 66 Volts 15th - It looks as

If a Leclanche Battery could have an electrolyte of strong acetate soda & not much NaOH, & dissolve more Zinc than straight 20% I notice some caffey goes into sol & is reduced by the Zinc to a black float also some on the Zinc but when rubbed Zn is bright — Used no Mercury

It is probable that there are numerous solution strongly alkaline that will dissolve much more Zinc that reg 20% NaOH & some will probably give better voltage Try a great number —/

Dulka little Cell -	12 ma —	Volts 70
	25	68
	50	64
	75	64
	100	60
	150 —	56
	200	44
	300	42
	400 —	38

Apparently with 4 times the surface giving 12½ Ma on this which is 4 times wanted gives same density at 50 Ma with Voltage of .70 Volt

In other words to raise delaude Voltage increase the surface of the CuO plate,

133 - Dup. N_2SO_4 Sat + 20 grms Lithium Acetate, not all dissolved, froth -/
Sol clear deposit ok but one corner burned up at top few bubble seeds.
½ day broke 3rd Gend 3 Hours

296 - Dup 3 Hours — 20 grms Potassium Acetate, froths - deposit ok all peeled twice, K always bad

Put in 6 gr Acetate Mg

Mg - now ~~green hydrated~~

Dup 118. 20 grms Magnesium Acetate, all Sol. Sol a little Cloudy some froth not mixed Anode OK brake 2nd top edges turned up plating OK,

402 - 1 hour 6 gr Sodium Acetate in 250 cc of a saturated Sol of Nickel acetate — Sol clear anode OK found it OK & peeled in the Solution & a 2nd good Coat on brake 1st Good Curled 3 Rev

69 - 1 hour Piperidin Sulfate Sol & anode clear No deposit red color —

75 - 1 hour Saturated Sol of Nickel trichloroacetate Anode & Sol clear scarcely trace of deposit.

put 6 Mg Acetate
in all cracked
peeled terribly

Fond

107 - 1 hour 6 gr Ammonium
Iron Alum —
Sol + Anode ok Come off
in Sol — Curled & Revolutions
broke 1st 6 cms — + new plating
on

75 Dup again but with
6 grms Acetate Magnesia
all covered with
N ~~OH~~ 2 green not
very adherent 1 Hour

107 Dup again with 6
grams Acetate Magnesia
Cracked + peeled terribly

349 1-Hours - 2 grms Diphenylamine
Sol clear Anode ok
fine plating Cant get it off —
I wonder if it affected the
8/4

Dup 248 – 1½ Hours 2 grms
Monobromin Camphor
Sol a Quite OK –
peeled at Top ——

291 – 1 Hour. 6 gr Pulosin
Molybdate. blue Quite
blue – No deposit whatever

404 Saturated Sol at 1 Hour
Nickel Acetate 50 grms
Sol Clear Quite OK 1 Hour
Top turned up broke 3rd

404B 1 Hour Saturated Ni Acetate as
above but 6 grms Mg Acetate
Sol Cloudy. Quite OK
End peeled broke 1st

Do more Dup
on 403 →

403 6 grms Sodium Butyrate
Sol cloudy, drops off
Plating perfect
Broke 4th

Dup 118: 40 grms Mg Acetate
3 Hours — dissolved in 1 to 1
H_2SO_4 + H_2O - Sol cloudy
+ slight sediment, Alloy
black. Cracked at
Edges, breaks 2nd time

403 6 grms Na Butyrate
all sol. Sol cloudy
drops off — flat.
broke 10th

Goll reports 17 1919 Sept

that the original 35 Litres of Conc $NiSO_4$ containing 2½ gms Magnesia acetate to Litre, had originally a Specific gravity of 1.300 — Since there have been 13 strippings of Nickel disc from it each Calipering about 5/1000 He has added so far more than 4 Litres of distilled water to allow for Evaporation ~~when~~ the specific gravity is now 1.220 it is very acid — but the 13th stripping is 5½/1000 10 Hours at 1½ to 8 amperes this Current with present Solution raises its temperature to 103° Fahr which causes evaporation

[55]

I notice all the 1 A group Expmt Nickel Acetate gave a big bubble froth on top of Each cell —

Lott Experiments. 17 Sept 1919

Sol 403

This is 1 A Expmt
6 Cells 250 cc Conc $NiSO_4$
each has 6 grms of Acetate of Magnesia + $NiSO_4$ unpurified
Each cell Marked 1 A 2 A etc
Dingl's Strip Anode used 8/4 2" Cathode. 400 Ma used, instead of the usual 200 on the 2" This is at rate of 200 ma per inch

1 A taken off in 2 hours
2 Corners turned up very slightly white Matte, flat OK. broke, 2nd bend another bend 3rd time
The Anode is very black
Some deposit on it very thin —
Acidity of Solution is

Original Sol. 0.10076 — based on the acid
1 A 0.30228

per 100 CC — Multiply by 2.5 for 250 cc

2A. Olt 1A Exponent. 400 Ma in 2"
Acetate Mg 1 anode
3 Hours plating. Anode in one
place dark other part clean
Sol very slightly cloudy
Plating 1 Cor very slightly
lifted other Cor 3 fine cracks
left gray
Strips of Coat Off
broke 4th bend,
bending whole width broke
4th bend —
Acidity —

2A 0.50380

400 ma on 2"

A 3. Ott = 4 Hours plating
2 Corners turned up a little
1 on top on on bottom
flat OK plating —
bending whole broke
6th bend — Anode black
thin — Nickel appears to
have no spring at all
stays where bent

Acidity

0.69532

400 ma

4A, 5 Hours, Oks Except flat, Two Tab Corners raised little. otherwise Ok
Bending Whole brake
3rd its so thick if thinner it would have bent more
its tough no opening to it
Anode lighter black -
Must be some impurity in the solution

Acedly

1.0076s

Otto 1 A Equipt 18 Sept 1919

5 A. 6 Hours

1 Corn Top lifted up — flat generally
Poorly Varnished Broke
9th Bend full size across
No spring — perfectly soft,

I think the varnish is attacked
as has no shine where immersed

Anode has only a slight tint
brown —

Acidity
1.15874

Total acidity increased
with the 250cc
327 grammes
of Hours plating —
figured as H_2SO_4
& but its acetic
& not H_2SO_4

Oct Expt 1 A

6A. Plating OK
only faintest lift at Top +
End fine — its dead flat
broke off the bend fade
across — anode brown film

200 MA per inch is
OK.
As there are 45 inches
to the disc immersed.
This shows that discs
Can be plated at 9 amperes
density with fine results
+ probably 12 amp if
necessary — We are
already using 7 @ 8
amp getting off fine discs
005½ thick 14 of them

Acidity
1.41064

If found that it is all metal
Except a blue on outside, Its
brittleness is probably due
to the simultaneous deposit
of blue hydroxide & metal
+ this peculiar reaction
is probably unsuspected
cause of plating troubles
in other solutions —

Investigate

250 cc Nearly saturated sol of
Cobalt Sulphate
1 Hour ~~[illegible]~~ 100 ma per inch

There is a deposit of metal
over that a green hydroxide
its not peeled or Cracked
it chips off by knife
Excessive brittle, Solution
appears acid —

Took it & made it Neutral
by $Co(OH)_2$ — then for fear
they had not added ~~[illegible]~~
1 Acetate Mg I added
4 grams more —
1 Reg Cathode 200 ma —
1 Hour
Frothing —

Same thing occurs
blue deposit something
must be wrong with
the Cobalt its right thick
but flakes off brittle probably
a hydroxide coating

424 — 1 Hour 6 gr Sodium Lactate Tracks Sol Cloudy/Anode OK All Cracked NG —

425 — 1 Hour .6 gr Magnesia Butyrate Sol/Cu Cu Anode OK — has 250 cc of N_2SO_4 — one Corner turned up — broke 4th band — Can prob make this work flat, sets.

Note = I find that 250 cc Conc N_2SO_4 with from 2 to 12 grams Acetate Nickel in which has been run 4 hours at 200 ma plating is acid & that it can be neutralized with 5 Lake $NaOH$ which has been dried with $NaSO_4$ etc in then recotaled but not again dried if this is

Kept damp & powdered up, it will completely neutralize the acid of Bring Solution to neutrality if warmed to 110 @ 115 for 3 or 4 hours, — Of course the freshly precipitated will work much faster. As the solution in plating goes to 100 a little heating the filter tanks of 10 or 15 deg will keep it neutral by passing thru the filter press —

We could have a double supply in stride tank drain off acid sol + immediately replace by new sol + then old solution could be neutralized ready for another change —

Dups of 87. last run in this book
I neutralized all 4 with percolated NH_4OH at 115 Fahr —

Now rerunning at 4 amps
Milamp for 4 hours —

Dup 87 — 2nd Run after neutralizing by percolated NH_4OH, at 120 °Fahr

4 Hours run at 200 Mke per sqr inch —

12 grms stripped about 3 hours

2 grms lifted some + cracked at Edges. soft

The last plating seems to have Split + Curled up but main body ok Raff

87 — 16 grms Iron turned up
+ Copper color —

4 grms. OK but last layer
turned up a little + Cracked
Very tough — Copper Color

I believe this solution
has Copper in it

It has —— boy had
anode so low that
Copper wire acted as
anode & shows eating
away —

3rd Run 4 hours
400 MA — with anode
not so deep in solution
All are acid. —

12 grms - Copped - Curled at edges
+ Rep. but good
16 Cracked & split Very Copper
4 = Copper - one corner left
only OK
7 = OK but waves in it

423—6 grm Potassium Acetate
250cc Nickel Acetate.
Neutralized Dol Cloudy
Anode OK 1 Hour
All cracked NG

421—6 gr Manganese Acetate,
250cc Nickel Acetate
All Cracked NG

422 6 gr Sodium Acetate
250 cc Nickel Acetate
Cracked at Edges Cantaloupe
NG

412 6 gr Barium Acetate
250cc Nickel Acetate
All Cracked NG

417—6 gr Lead Acetate.
250cc Nickel Acetate
Black Mud

418—6 gr Acetate of lime
250cc Nickel Acetate
All Cracked NG

4th Run of the 87 Dup Y
neutralizing, its get Copper in
Y9 put the K Cells on with
only 25 ma to plate Copper out

Eating off Nickel from
working moulds —
$2\frac{1}{2}$% H_2SO_4 — at 180° F. on
hot plate does it in
12@15 hours — any
higher amount of acid
apparently don't
diminish the time —
up to 50% water 50%
H_2SO_4 — This works
OK in 15@18 hours

Acetic acid NG —

10% H_2SO_4 with some H_2O_2
15 hours OK — good —

5% HCl 15 hours 180°
no doubt ~~[illegible]~~
it changes and will
do it —

10 Oak 2½% to 5%
with air & 180° Fahr
should do the trick
fine —

4th Run of 8% — Magnesium Acetate

2 gr OK but has the waves
1¼ gr waves 1 Corner lifted
16 gr Waves 1 " + Split
12 gr " Split in 1 place
others OK — No Copper Colors
All Seam Thermos Chain
used —
Thesol is rather strong
I put in 1/4" water &
started them again
for 5th Run

Flake — 20 Sept 1919

Reg $NiSO_4$ Conc + 10 cc $CuSO_4$ — plat anode for Ni plating Copper anode for Cu plating works much better than with acetate Magnesia —

Reg $NiSO_4$ — 250 cc 10 cc $CuSO_4$ and 20 cc free glacial acetic acid — This is the best of all tried + possibly it will be commercially successful. It needs acid — lactic seems especially desirable as it does not appreciably attack the plated Nickel while the 3 times longer time Copper is being plated.

Needs improvement as do the Copper that makes Nickel plated out dull matte + undesirable. It is very necessary to have

the smallest possible quantity in solution with 10 cc $CuSO_4$ in 250 cc $NiSO_4$ – there is too much Copper as it affects the Ni if I use only 5 cc there is not enough $CuSO_4$ at Cathode to cover the previously plated nickel Now here is the Egg of Columbus Use only 3 to 4 cc – agitate while Copper plating this will bring Enough Cu to anode to give good Coat, stop agitating just before Ni starts plating say ½ minute before then no fresh Cu is brought to ~~cathode~~ when Ni plating but plenty when Copper plating.

It is desirable that the Cu should be a constant quantity I use a Copper Anode which puts in as much as is taken out Then a Ni Anode to supply that taken out, Ni Anode has large surface —

but on Ni plating considerable in fact all the Cu in vicinity of Cathode plates out with the nickel, + therefore a sub Cu anode should be connected to the Ni anode thru a Rheostat which can be adjusted to give to bath as much Cu as it removes.

Any minus can be corrected from time to time by adding $CuSO_4$

I have just got bright Ni + Cu by making Reg $NiSO_4$ 1/4 strength pouring out the acidified sol of 250 cc Conc $NiSO_4$ containing 10 cc $CuSO_4$ + perhaps 30 cc acetic acid - leaving say 75 cc of sol + adding water to bring to 250 cc. By stirring when plating Cu + not while plating Ni stopping 1/2 min before Cu plating

finished got 4 cycles
of shiny Cu + Ni —

use 30 Ma on Cu 200 Ma
on Ni — I have been
using 350 @ 500 Ma on
Ni —

I stopped stirring
then scarcely a sign of
Copper deposited as
now there is only 2½ cc
+ not enough Cu in Sol at
Cathode to make an all Cu
blush in 3 min —

I will now stir — its OK
When stirring fine Cu deposit
+ as there is very little Cu near
Cathode + stirring stopped
½ min before Ni plating
the Nickel is good —

I will dilute it ½ ~~again~~
+ try again —

This works even better

It looks as if not much of any Copper need be in solution that by vigorous Circulation the current action on the Cu Anode produces sufficient Copper Sulphate to supply the film & the Cu Anode could be cut out & switched to a Ni anode so as not to make any more Cu & what $CuSO_4$ that was in sol would be plated out before Nickel started depositing

If this works strong $NiSO_4$ sols could be used, reducing & Continuous plating —

The Nickel plating time could be increased to 3/4 min or Even 1 min & Copper reduced from 3 min to 2 min depending on the circulation —

Sept 20 1919

5th of of 87 — Bent whole strips —

2 gr Waves. but OK 10 to bend

4 gr No waves OK 10

12 gr Waves - 1 Cor lifted up 11

16 gr Waves 1 Cor " 10

Same as 12

This is best lot yet showing that it improves due probably to more free acetic —

Will run 6th run

All are thicker than previous platings

at 400 ma both Cathode + Anode gas very much

Yet plating good —

Flake — Used 300 cc saturated N.SO4 — 3 cc CuSO4 —
If stirred while Cu plating stop stirring after 2½ min plating for ½ min 10 Ma per inch
deposits Cu OK if 25 Ma per inch Ni deposits must keep at not more than 12 Ma per sqr inch for Cu —
~~Flash~~ made several cycles OK —

I then took 75 cc of above solution & diluted it with water bringing it to 300 cc — This reduced the Cu in solution to sevententh of 1 cc. — Even on stirring it scarcely showed a flash of Cu, However if I had very vigorous circulation I feel sure it would have deposited good Cu,
The nickel is ok but instead of 250 Ma per inch in Conc Sol had to reduce to 100 Ma per inch —

A/3 300/74

Everything goes to show that
5 cc of $CuSO_4$ saturated in a
Conc Sol of $NiSO_4$ in the
Cold & Vigorous stirring
that Copper films will be
satisfactory 10 ma per inch
& Nickel 200 ma per inch
but think should have
1 min on Nickel & $2\frac{1}{2}$ min
on Copper to give right
flake
Also it may be necessary
to Triple plate Copper Every
15 @ 20 Cycle to correct
character of deposit.

With the 75cc Weak Solution
I notice that without stirring
no Copper is deposited
but plenty when stirring
also notice that without
stirring the Nickel deposited
is insufficient to ~~cover~~
hide the previous Copper

from this the only inference is strongest Ni Solutions & Cu so low as not to appreciably depositing at 10 ma per inch when not stirred & the stirred with a vigor sufficient to bring ~~the~~ necessary Cu to the ~~[illegible]~~ Cathode —

I noticed bright wave finally depositing on Cu & I added a little acetic.

It seems necessary in all sulfate solutions to have some free acid & acetic seems best,

NOTE I find that with 8 gms Ni acetate in the 300 cc Cone $NiSO_4$ + 3 cc Cone $CuSO_4$ that no gas comes off on Ni plating 150 ma

per inch + think this is
best solution ~

I have just made 6 cycles,
12 Ma - per inch on Copper plating
150 Ma on Ni plating —
3 cc $CuSO_4$ — Stirring at about
of Copper plating for 2 ½ min
stopping stirring for next ½
min to allow solution to stop
circulating + then Nickel for
30 seconds —

The results are perfect

Think 100 or more cycles
are OK —

Fred is to rig up stirrer
+ contact to stop it for
1 minute - during last ½
min of Cu plating + during
whole of Nickel plating

6th Run – 4 hours & 10 min

4 grms Perfect — flat
had some few sharp points on
9 blends –

2 grms – flat, had left at bottom
slightly so a little ni placed in
9 breaks

16 grms Scarcely any
deposit focend film self
stripped left off

12 grms Only a thin
deposit very adherent
had trouble strip it off
film in col self stripped off

[illegible]

[illegible]

[illegible]

The 7th run of 87 Dropped
I neutralized the 12 gram
acetate Ni Cell & left all
the acetic acid —
see next page

414 = 250 cc Nickel Acetate
6 gr Cobalt Acetate
1 Hour peeled in Sol & only

419 — 250 cc Ni acetate
6 grms Lithium Acetate
peeled in Sol

405 — 6 grms Magnesium
Oleate in 250 cc $NiSO_4$ Conc
Cracked edges — 1st time

413 — 250 cc Ni acetate
6 grms Cerium Acetate
peeled in Sol —

Ford

Note

12th Neutralized this is not as good as 16 not neutralized — its necessary to have good acidity

415 — 250 cc Ni Acetate
6 gr Copper Acetate
Bath — N 9

426 — Eat with Ni Acetate,
250 cc green hydrogen on
Cathode pool

4th Run of Dup 87 — with 12 gr
cell neutralized

16 grms — Curled away at top &
sides but not Entirely all
covered with Copper

2 grms flat but it had separated
near top a thick of Ni on Cathode
but OK

4 grms Same as 2 gr Copper
10 breaks —

All above plating OK
but stripped but flat if these
Conditions would be perfect
I will not make 8th Run
the 12 gr neutralized it also left Cathode

8th Run 4 hours Dec 87.

Note 12gr was neutralized on 7th run

2 grm - float OK - just lifted a trace at bottom but only a blush of Ni on 8/4 at Corner Tinged with Copper

4 grammes nearly loose but only little blush of Ni on 8/4 at bottom - float, Tinged with Copper

12 - loose in Cell - 8/4 only little Ni on probably stripped 3 3/4 hours float tinged Copper

16 - tops Edges Turned up nearly loose only blush of Ni on 8/4 - Badly Coppered

Copper may come from Lead Vermicular Tube acting over night.

Put in for 9th Run

Edison Special A
I am putting up 4 cells
250 cc Conc $NiSO_4$ —
with 2 4 6 + 10
grammes acetate nickel
to be run continuously
on Cathodes which have
no 8/4 on so they could
not strip - using 400
ma — & continue a
longtime —

9th Run Dup 8/-

12 gr neutralized others not.

2 gr lifted one top Corner
leaves — no Cu — seems thinner

4 gr — nearly flat top lifted
scarcely a blush of Ni on 8/4

12 gr — lifted bottom Thick
only blush of Ni Nearly
flat,

16 — Curled up &
Considerable Nickel on
8/4 — Spongy —
looks as if Plate was
approaching failure
its too acid —

On for 10th plating

Note — Sept 23 1919

Carbonate Nickel is just as good if not better than Nickel hydroxide for neutralizing the $NiSO_4$ Conc & acetate Nickel solutions after they get acid & will work better in fatter [illegible]

10 Run Dep'd 8½ —

16 gr lifted all around Edges & considerable Ni at Edges — nearly flat —

4 gr stuck tight, got it off ok spongy + not thick

12 = lifted sides + bottom flat, little thicker than 4

2 gr nearly off & 8/4 almost covered, matte,

C1173

But I note that the nickel after 30 cycles is very brittle & broke away possibly it is due to float $NiCO_3$ as we have trouble with float ferric doing same thing in disc Ni plating

Sept 24 1919

The flake plating Auto Scheme the solution soon gets too acid and the very slight deposit of Copper is soon dissolved by acetic acid that is free when too much is free, by keeping a small quantity of Ni hydroxide or better still Ni Carbonate the Revolving Stirrer breaks it up to fine pulp — the solution becomes nearly but not perfectly neutral which is just what is needed. There is always a little Ni Carbonate floating in the solution — in this case the Copper that is plated on is not dissolved or is OK as well as the Nickel — poor efficiency of Ni anode is thereby corrected but we must get high efficiency on our Copper anodes or be compelled to add Copper from time to time I prefer large surfaces of Copper

The Carb Ni pulp floating in solution does not get attached to Cathode or interferes with plating

Of all our Ni Solutions
Lithia Citrate gives toughest Nickel
+ 100% OK

250 cc NiSO4	2 gr Citrate Lithia		broke	18th
	4	"	"	20th
	12	"	broke "	10th
	16	"		13th

Nickel acetate next toughest

250 cc NiSO4	2 grm acetate Ni	OK	broke	8th
	4	"	OK "	10th
	6	"	OK "	4th
	8	"	OK "	10
	12	"	OK "	3rd
	16	"	OK	3rd

Just had a test of the New Ball (Hardinge) for grinding up 1% on 30 mesh New Blank mix of Clay Cotton flock + Oxidized Linseed oil + Oxidized Rosin — Mixed together in powerful Steam jacketed Mixer with paddles Steam heated — The Capacity of their smallest

Mill ——— size gives us
good OK mix with 1% of
stuff left on 30 mesh. This
Consists ~~of~~ mostly of flakes
made by dropping of one on
another from height 2 or 3
ribs in Motor leaves only some
of balled Cotton + lies 1%
is put back for reprocessing

The Capacity is 75 lbs hour
Speed 38 Rev —
Think 85 to 90 lbs hour is
OK yours —
Dead sure of 2000 lbs in
24 hours — or 1780 520 gram
disc blanks —
Possibly 2000 blanks
per Mill —

11th Run 87 Dup - 400 ma

12 gram was neutralized on the run & thick -

12 gr — OK only little Ni on 8/4 -

2 grams ~~to Thin Coat off~~ THE NOMENON ~~Voltage Very Good but to Limit efficiency was good~~ ~~Ni to Exchange~~ ~~with the H2O~~ Wavey Came off in the solution fresh deposit thin about right thickness

4 grams Wavey one cor lifted but its about right thickness only little Ni on 8/4 cathode surface

16 gr — thick some Ni all around 2 amps -

I now neutralize 2 gram Cell - took over 2 Cubic inch bottles like Ni(OH)2 to neutralize showing Ni Anode Very low Efficiency

Must have plated out 15 @ 17 grams Metallic Nickel from each cell —

409 - 1 Hour 250cc Nickel Acetate 6 grams Solution Acetate, Neutralized
Very adherent black deposit scrapes off with knife in fine thin scales —

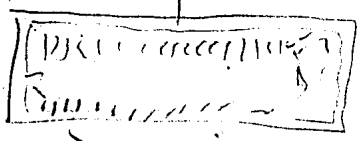
408 250cc Nickel Acetate 1 Hour — 6 grams Diphenyl Acetate. All cracked & peeled NG

Note →

12th Run Dup 87—

12½ gr was neutralized on 7th run
2 gr on 11th run - Then no further since neutralizing

2 gr All split & Curled up around the Edges



Rollers

Neutralized it with Na Carbonate

4 gr Came loose in Solution. Considerable Na placed at bottom end — some at 2 Top Edges flat, fairly thick

12 gr Perfect plating flat seems quite thin,

16 gr — 2 Edges turned up a little, Same thickness as 12 gr—

Now for 13th Run

See 1st Expt

One of Expmts given LOCC —

Solutions 1B 2B 3B 4B 5B & 6B
all on at 5.25 am.
400 ma —

	acidity original sol	cc of NaOH 0.1		grms free H_2SO_4 per 100 cc acidity
1 B	off after	1	Hours	0.2519
2 B		2	"	0.4534
3 B		3	"	0.9068
4 B		4		1.0076
5 B		5		0.9572
6 B		6		1.1083

4 & 5 B tried again to check

5 B Cracked along sides - lifted at top - nearly flat,

4 B — Ckd at Edges top curled up - flat, not so bad as 5 B

3 B Not cracked on sides but turned up bottom Ckd & turned up

6 B Cracked along Edges lifted,
This is about as good as any of the above Very soft - if it had been Clemsch would be ok

OVER

[13]

2 B.. flat. ok but lifted away all around Edge -

1 B - Cracked lifted - no better than the others

Evidently This solution is no - probably because it started neutral - Evidently good plating is only possible in good acid solution

---

Petersons cut flake before separating has 33% of lead in it - He is using the old peroxide on P pole trick
Cu 0.072%
Pb 33.63%
These samples brought over by Dholos, Sep 25th 1919.

Petersons separated flake has 0.68% of lead
0.23 Copper
another lot 0.93

13th plaining 87 - 10 deep

12 reload gr on 7th 2 gr on 11th

12 gr one side whole length
Curled up otherwise OK

16 gr Nearly OK Two Edges
turned up a little - 1/32 along
Edges lifted - slightly warping
flat generally OK

2 gr flat surface has specs
turned up 1 top Edge a little
& 3/4 shows little scalopping

4 gr - OK except 1 Edge
turned up slightly

Req flake brot over by chalcs
2½" bottle. 6" high —

Seperated very heavy books
by floatation. These averaged
12 flakes to a book —
Weight 0.5040

a second seperation obtained
lighter books, average
about 4 —
Weight — 0.1140

Balance which was
single flake with occasional
2 flake book —
Weight 4.987

Total 5.605

12 flake books 9.18%
3 " " 2.23
11.41 %

Flake

The more experience I get the more necessary do I find to have the solution very acid with Acetic —

A very good sol is 1/2 saturated $NiSO_4$ – 250 cc $2\frac{1}{2}$ cc $CuSO_4$ + considerable excess acid – acetate nickel

I am not sure yet if saturated or 1/2 saturated $NiSO_4$ is best both having same Acetic acidity – of course 1/2 of 6 gms acetate Ni

The apparent advantage of a dilute solution is that even when $NiSO_4$ is 1/2 saturated there is more Ni than necessary whereas the strength of $CuSO_4$ is just 1/2 + therefore does not disturb Ni plating as much —

Results 13th Run 87

2 grms bottom + 1 top Cor
lifted — nearly flat,
good plating

12 grm Perfect, OK

4 — flat bottom Cor
lifted very little, flat,
OK plating

16 grms OK. only left
1 Corner

Nowgoes to 14th plating

By using Conc $NiSO_4$ —
6 to 8 grms in 250 cc of
$NiSO_4$ of Acetate Manganese
deposits on Anode Light brown
peroxide now reversing +
make the Anode a Cathode
Nickel plates on but without
the Ni is tough & Contracts
+ breaks MnO_2 away
Must be our req 250 cc

C41J

Sept 26 1919

of $NiSO_4$ Conc 6 gr Acetate Nickel + 6 & 8 grams Manganese Acetate + some free Acetic acid at then works fairly well —

125 CC Conc $NiSO_4$ — 125 CC water — There is in the 125 CC of $NiSO_4$ 3 grams of Acetate of Nickel + a little $CuSO_4$ — How much Can say probably 2 to 2½ CC of Conc $CuSO_4$ As we know now the necessity of free acetic acid I add 10 CC of glacial which is pretty strong acid.

27 Cycles best yet but Ni is full of fine warts, + this is the Limit probably 16 cycles Commercial —

C1433

Flake →

Sept 26 1919

We are now going over all our old $NiSO_4$ solutions with various chemicals in them & adding to each 5 cc of Conc Copper Sulphate to each one & plating Nickel out on our 2" surface Cathode in presence of this Copper. which generally has a very bad effect on the Nickel plating most of them show very bad plating in 15 to 20 minutes at 200 ma Hours –

So far 274 – 6 grams of Citrate of magnesia has gone 1 hour & the plating only shows slight dark tint This would probably give 60 cycles for Flake Its behavior is remarkable However in 1 hour it shows fine warts under Microscope & would be no good probably 40 min plating was good

124. 6 gr Manganese Acetate has gone 1 hour + its just as good as 274 Except it is much darker it has isolated warts much larger than 274 + blacks specs I noticed that when 274 was very bright + good plating 124 had a dark tint,

I removed 274 + found it very brittle Top 1/2 stripped off Couldn't get bottom 1/2 off — its too brittle to be careful — The warts I notice are knobs + not spongy like 124 — Think this solution can be doctored —

On diluting 274 with water to 300 cc + put in automatic bath — The first plating of Ni was very bad — Here dilution was bad Run this down, 25 cycles looks fine — flat, flexible —

Fuellers work

Is this Cerous or Ceric Sulphate.

Note

Very promising

Note The Auto bath has 500cc so that when a Reg 250cc lot is put in bath there is 250cc water added —

Flake — 5cc CuSO4 in old solution
129 — OK for 20 min —
then started dark —
its splits along Edge —

271 = 5cc Cuboy 5cc free Acetic
1 hour 1 hour 13 min —
cracked early along edges but pretty good plating for 40 min
off 1 hour 13 min — surface very fine warts + the limit

No 2 — Sulphate Cerium 6 gr
This has been on 1 hour
+ bright good surface under Microscope it is starting to show very fine warts with the start of black spots on top of warts I think this is best yet in fullers solution think these warts would not appear —
1 hour 6 min I looked at it.
5cc Acet. 5cc Conc Cuboy no accelerator
OK at 1 hour 30 min good grain some Nodules top

Note →

125 6 gms Benzoate Manganese
45 mins, no water good surface
bright. Lots float stuff on vol.
Water runs from the plated
surface — This is best
surface so far —
has 5cc Conc $CuSO_4$ + 5cc
glacial acetic —
Evidently Benzoate Mn is not
very reliable —
40 minutes OK —
1.21 Hour 35 mm dark + warts
not good — 40 mm Limit

NOTE

So far # 2. Conc $NiSO_4$.
6 gms Sulphate of Cerium
best. 2 hours at 200 ma
when got black knob wart.
Think there are built up
specs + would be absent
in a highly filtered solution
Will dilute the 250 cc to 500
+ put on automatic
Has in the 250 cc 5cc Conc $CuSO_4$
+ 5cc glacial acid acetic —
not sure about acetic but think so —

136 — Fair

Gall wants a good water proof Material to stick a .005 Nickel stripping onto a plating disc i H2 uses Celluloid on face & then Beeswax over matrix lays this face on Celluloid & platten puts in press & heats under pressure

Jolual Cumarone resin works but there are infiltrations & Cu around Edge plates on matrix in Epoxy & Other Beeswax used to much bubbles But Beeswax has an oil in it & this gets on surface of bath & causes Cain with plating

I make the following suggestions

1st Get Gutta Percha Tissue
lay over Celluloid 2 or 3
sheets then put on Matrix
then heat & press —

2nd Pour liquid hot melted
White Carnauba on matrix
& spread —

3rd Use Balata sheet,

4 — Look up old book on
Shellac & select a very
low MP combination of
say Bela Kapilal & Shellac
which adheres to duck &
softens at low temp —
~~On~~ & while Melted pour
over Matrix —

5 — Shellac & Trichlorophenol
do its neither hard at
and temp but can be bent
for pouring on matrix or
make sheets by pouring
on tin foil & using these sheets

6 = Rosin base Melted with
Either White Ceresin
Black Ozocerite, Parafine —
etc —

In fitting Leclanche battery
Copper Electrodes Malgamed
together, I find by marking
the dry Cu 160 nickels
with Conc Sulphuric that
if heated to drive off the SO_3
that it looks it hard,
& seems best yet The Conc
Sulphur does not attack
the metals, find out proper manipulation

Increase driven size $2\frac{1}{2}$ times
this will be about 15 min to
a cycle
Also try — 1st filtering solution
Continuously to see if it gets rid of
Dearts & black specs
2 = If it dont try the Dimroddie
Dope used in Cu baths — use only
2 mlg at first & then gradually
add 1 mlg at time

Sept 28 1919 —

3:- Can use a Nickel plated iron Can for filtering or Hard rubber square box —

4) Move the apparatus in balance room so 6 Cells can be used in series —

Regarding Lelande CuO plates H_2SO_4 Conc or even 50% seal works — After heating to 1350 for 4 hours there is still some sulphate left. The plates can be put in hot water + all the $CuSO_4$ leached out before putting in NaOH,

Try Rosin in Alcohol also in powder also in Volatile Oil like Solvent Nap, etc — On heating Rosin forms a Resinate of Copper this is then burnt out in time at 1350 with hot air — Oleate also —

Sept 29 1919

Try Ammoniated Cu —

Our Reg seperated Nickel flake has no lead has 0.325 % Copper —

For fastening .005½ Nickel record on to holder for backing up with Copper in plating bath. I find Rosin with Stearic acid is fine low MP + Viscous + sticky — am determining best % of Stearic —

Stearic acid added to Rosin + melted has a remarkable effect in changing its character. a very small % of Stearic melted + poured out leaves the alloy permanently liquid of enormous Viscosity Can be pulled out in threads

Sept 29 1919

With 10 parts Stearic to 100 Rosin its can be bent at old Temp with 100 Rosin 20 pts Stearic its semi hard & flows like Tar in the sun, not brittle & can be drawn out in threads with 100 Rosin 40 Stearic its a perfect imitation of Beeswax The 1st 2 are Rosin Color with 40 stearic, its dirty white This is probably best for gall to stick on disc: on plating holder ——

I have just tried as a binder 8% Rosin in CuO Delaude plate to fit together it appears to be OK & burns away leaving a good fit —

262 - 250 cc $NiSO_4$ 6 grms Na Bichromate no deposit takes place in several hours on Cathode —
put 6 grms Acetate Ni in 6 ol —

Sept 29 1919 —

1 gram Copper bath dope to 125 cc of water — This is strength of solution put in Copper baths —.

The old solution 30 Litres of Conc $MgSO_4$ with 32 grams of Acetate of Magnesia per Litre. has been working for two weeks night & day. We have just removed it from the bath It has given us with pure M Anodes 38 full size dep moulds. 005½ thick and perfectly Malleable laying flat when delacked up to 30 after that it got harder & started to curl up until the 38th coiled itself up in a roll.
As the use of Magnesia Salt of Acetic would cause the removal of the whole of the solution to remove the Magnesia We are

Replacing it with 40 litres of Conc $NiSO_4$ & adding 32 grams of acetate of Nickel which work even a little better. Any free H_2SO_4 immediately displaces the Nickel from the acetate freeing the acetic acid which keeps the solution neutral as far as H_2SO_4 is concerned but very acid as far as the acetic is concerned. Acetic has but little effect on the Nickel deposited to diminish the Efficiency, + by keeping the Sol free of H_2SO_4 beautifully Malleable nickel is obtained. When the solution gets too acid (12) Acetic Ni hydrox or Carbonate is added to bring it back nearly neutral reforming Nickel acetate rendering it unnecessary to remove the Solution,

301 Acetate Manganese
Pretty good — 5cc CuSO4
5 cc Acetic acid —

301 — 200 ma —

1.7 cc CuSO4
5 cc acetic acid
2 gms Acetate Mg
80 cc MnSO4
Made up to 250cc
Went 7 hours pretty fair
but too many nubs

17 hours nickel based panels fairly
bright 90% is fine grain & OK
balance only wants to break
down out

Evidently 1.7 cc per 250 cc
is OK — with 1/3rd the
MnSO4 that a Conc MnSO4
250 cc has —

With the 1 Reg Rubber
bath with felter that
gall has been using a
which 30 .005 ½ malleable
nickel discs have been
plated 7 amp 10 hours
Each containing
24 grms Magnesium metallic
per litre, 35 litres —
There was about 3 or
4 oz of mud caught in
the felter cloth bags
This was almost entirely
~~ferrous~~ ferric hydrox
probably comes from rod
holding disc holder & from
anode which is said to
be CP nickel & probably
from elsewhere —

Phenomenon
37 = Saturated Sol

Bromate of Nickel
5 cc $CuSO_4$ 5 cc Acetic
Plates Copper out instead
of Nickel — good Cu plating
bath still — 240 ma
per 2"

For 78 Ni baths, 450 galls
leaving 115 gals Excess

Requires 60° Fahr —

1852 lbs $NiSO_4$ 6 aq —
335 gallons water ? ~~will~~
~~determine this accuracy~~ ok

90 lbs Acetate Nickel —

~~Starting 20 baths instead~~
~~of 78 | 78~~
~~Bath of requirement~~
~~about 115 gals~~

Latest,

387 – plated Ni out
Off for 3/4 hour –
with 5 cc $CuSO_4$ in –
to Camphorate Soda –

20 baths
474 lbs $NiSO_4$
86 gals water
22½ lbs acetate Nickel

This is theoretically
saturated –

But it may crystalize so
I will increase the water

474 lbs $NiSO_4$
95 gallons Water
22½ acetate –

This for 20 Baths,
Spec grave 1.362
should be
with 86 gals water –

3

I removed the Ni from Drip 87
Run about 35 @ 40 hours
250 cc Conc $NiSO_4$ —
4 grms Nickel acetate,
after dripping
Weight 9.900 grms
flat, 2 sqr inch.
Think I was 200 or
300 ma probably later
still — on & off at times

This is Malleable
Excellent,
only round low knobs
no points sticking out

I rolled this out 3 times its
length without heating its
still soft & didn't crack
Except where lumps at Edges
flattened — FINE
Its in my Desk in Library

Flake plater

250 cc Fluosilicate Nickel
15 cc Acetate Copper Conc
Deposits in auto flake black
Copper deposits over Ni
dark red NG —
There has always been something
wrong with our fluosilicate
although its beautifully
Crystallized —

flake plater

250 cc Conc NiCy KCy
15 cc CuCy KCy —
Plates — This deposits
Copper at 20 Ma or 200
Ni dont deposit at all —
Cu deposited is very good
The Nickel wouldnt plate out
Even with 500 Ma —

436 = flake tester

250 cc NiSO4 20 cc CuSO4 Conc
8 grms Mg Acetate.
Dark Nickel too much
Copper — I now put in
15 cc Acetic — No Better NG

429 - flake plating

250 cc Nickel Acetate
15 cc Cu acetate
both saturated, 1st deposit Ni
not bright has streaks from
specs - Copper dull

Now add 10 cc of Acetic
acid (glacial) -

Nickel dark no improvement

---

430 250 cc Ni Acetate flake plating
15 cc $CuSO_4$ Conc
Dark Nickel - no

Aug 27 Experiments in Progress + finished

1 = Improved CuO plate, Expmtg

2 Ford starter battery - Hanley Burns
Kircher Edison.

3 Audion storage battery Edison

4 Regeneration to sulphates of the Copper + Nickel carbonate by-product from storage battery, Doughterty - preliminary Expmts done

5 Rapid Copper plating - Edison

6 Rapid Nickel plating, Soft finished

7 SMG + Chalko.

8 Seperation old cell mix into $Ni(OH)_2$ + useable flake Edison

9 = New blanks for Disc, Dally + Dunwiddie nearly finished -

10 Automatic Varnishing Disc blank

11 = Long funnel recording for disc Exptns Edison, W Miller

12 Dam power in flake plating and improvements to cheapen

13. Utilization of waste flake Ni. Off from factory Edison

14 Substitute for some or all the hard rubber parts of SBat to Cheapen. Edison

15 - Extracting Lithia from ore process Edison

16 · XYZ Exptns Edison

17 Process for seperating Ni + Cu by roast + magnetic on Sudbury ore

18 Mfg sheet Ni + Co by Copper sheets + 8/4 Edison

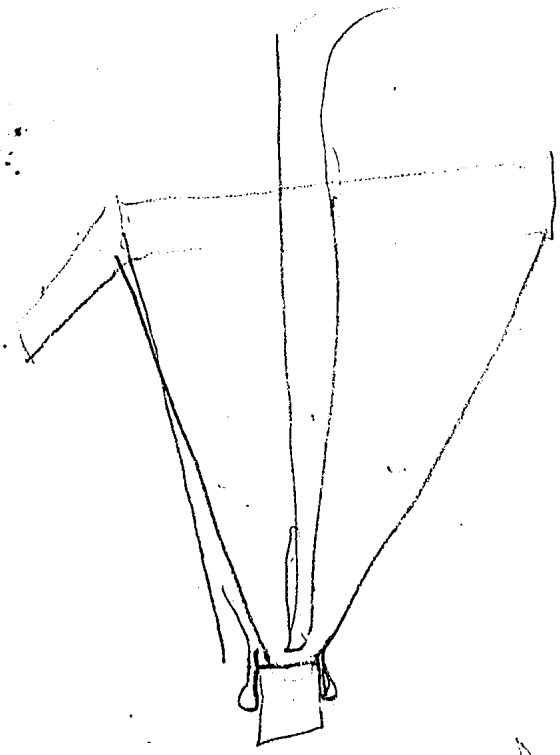
19 - Removing Ni from working Moulds

C1913

Sept 10 1919

~~Following gave negative~~ Nickel from 100 ma per cmch
~~of Hydrogen 4 OK 1 hour~~

	1 Hour	3 H.
Boric Cu	OK	no



Wolfenden

[ITEMS(S) FOUND IN BOOK]

10/2/19

Mr. Edison :-

A saturated solution of $NiSO_4$ at 22°C (practically room temp) shows Sp. Gr :- 1.362

and

1 Liter = { Water 744.2 grms
$NiSO_4 + 6Aq$ 493.0 "

1 Gal = { Water 2817. grms
$NiSO_4 + 6Aq$ 1866. "

and to make up 450 gals will take

Water :- 335 gals.
$NiSO_4 + 6Aq$:- 1852 lbs.

901.2 lbs Nickel Acetate should be added for strength of 24 grms per L